



# Bayesian Network Based Multiagent System— Application in E-Marketplace

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*(Received and accepted April 2002)*

**Abstract**—The concept of e-marketplace has been touted through the extensive use of the Internet. However, the task of filtering the potential supplier base in the e-marketplace is tedious while evaluating all the necessary qualitative and quantitative decision factors. Since the buyers have to evaluate and select suppliers by conveying necessary contingent information among potential suppliers, a superior structure of a multiagent system is constructed in this study to present the characteristics of the e-marketplace. The illustrative examples' results prevail to show that, after communicating among the virtual e-marketplace, the suppliers did know how to adapt their strategies to accommodate buyers' demand. On the other hand, the buyers also know which supplier is the most appropriate for short term as well as long term. © 2003 Elsevier Science Ltd. All rights reserved.

**Keywords**—E-marketplace, Supplier selection, Bayesian belief networks, Multiagent system.

## 1. INTRODUCTION

For the fast evolving e-commerce, most of the large companies are looking for suppliers which can help them to achieve a competitive position and sustain it over long periods. The above-mentioned advantage can be obtained while considering all contingent factors, such as good merchandise quality, better customer service, and efficient communication among suppliers base. In such a manner, most buyers of raw material and industrial parts search for potential suppliers through the Internet, where they can utilize sufficient information to evaluate, compare, and then select appropriate suppliers efficiently. Although long-term alliances have become very popular, small-to-median size companies still focus on short-term buyer-supplier relationship only, where the e-marketplace can substantially fulfill such a requirement. However, McCutcheon and Stuart [1] commented if only focusing on the short-term factors, such as cost, quality, and delivery only, the corresponding companies would consequently suffer long-term negative impact resulting from such myopic consideration.

Furthermore, it is very common for suppliers to obtain buyers' detail purchasing behaviors through referees in order to adapt their marketing strategies in an e-marketplace. On the other

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hand, buyers' procurement related activities, such as searching products, finding appropriate suppliers, and bidding with them, also require sufficient reference of suppliers in the corresponding field. These kinds of information are usually expensive and not neutral. Accordingly, this study attempts to resolve such drawbacks via intelligent multiagent architecture in the e-marketplace to enhance the efficiency as well as quality.

Moreover, this study intends to provide a better insight for short-term supplier selection employing the benefit of long-term alliance, where agent technology is utilized to represent subdomain knowledge experts and to coordinate all the required quantitative and qualitative factors in considering the fitness of potential suppliers in the e-marketplace.

## 2. LITERATURE REVIEW

With the trend to outsource more and more of value-added content, strategic sourcing is growing in its importance for most firms [2]. For such a reason, many companies are seeking an efficient approach to manage their supply base through alliance in order to eliminate uncertainty from the external supply chain [3]. A lot of literature has surveyed the issues in selection of supplier alliance partners [1,4,5]. Among them, there are two major categories of impact factor to choose supplier alliance partners: one relates to the technology being used to select a supplier [6]; the other relates to the ability to develop mutual goodwill trust with the target supplier [7,8]. Empirical research by Toni and Nassimbeni [9] on Italian plants verified that advanced buyer-supplier interaction and cooperative supply management exhibit a predictive validity of the plant performances. Accordingly, companies should consider long-term supplier alliance during the short-term planning horizon as well.

Agent technology has been applied in many domains [10,11], in which the common systematic approach is depicted by Figure 1 [12,13]. Each agent, which inherits its own constraints and set of actions, will react to the environmental stimulation with its appropriate action policy. Such reactive ability can be employed to handle tedious decisions for human beings and offer effective information while making decisions. Furthermore, in order to utilize each agent to represent the subdomain of the whole environment of interest, a multiagent system will be constructed. This kind of system requires corresponding agents to retain their inherent autonomy and to cooperate with others. In practice, the multiagent system has proved to solve many problems and accomplish complex tasks for human beings [10,11,14].

In any e-marketplace, suppliers and buyers do not know each other's detail policy, such as willingness to improve customer's service level, etc. However, they can evaluate and infer the

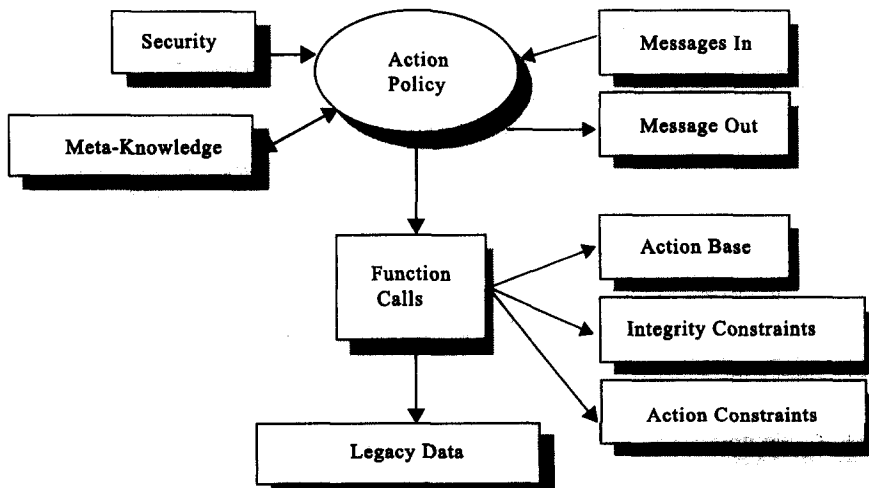


Figure 1. Common structure of the agent system.

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